

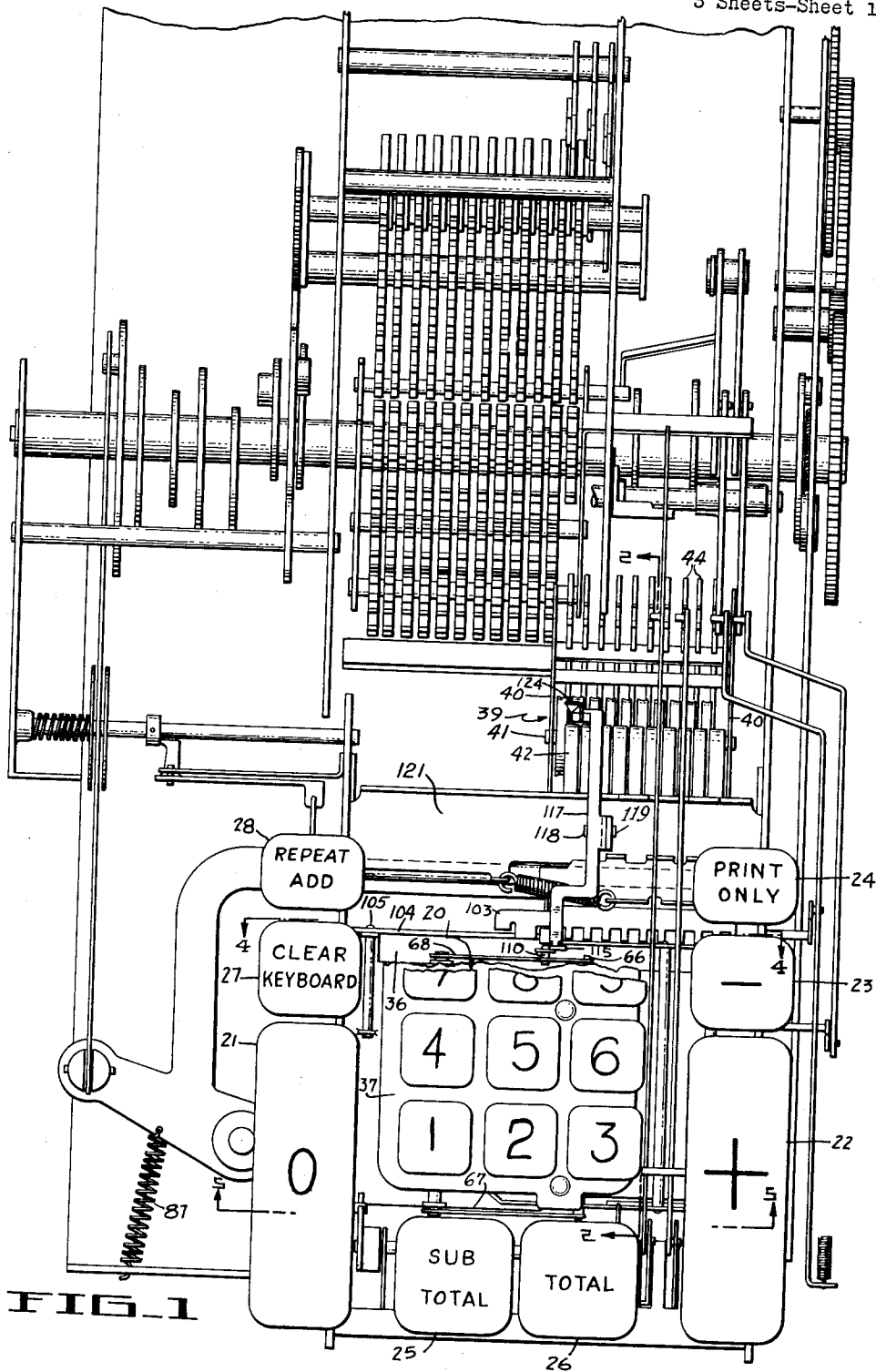
Sept. 25, 1962

H. J. CHALL ET AL
CALCULATING MACHINE

3,055,579

Filed Dec. 22, 1958

3 Sheets-Sheet 1



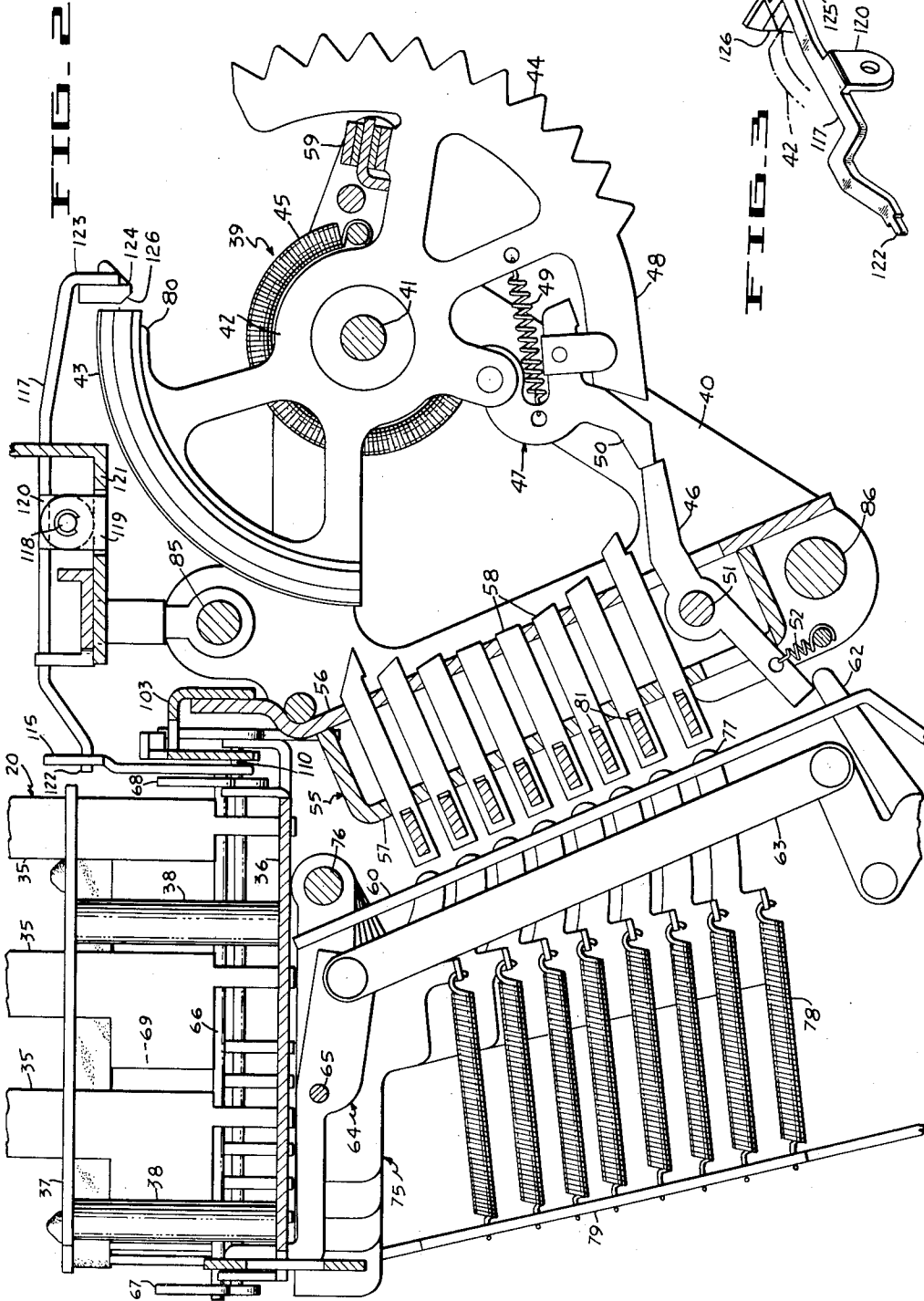
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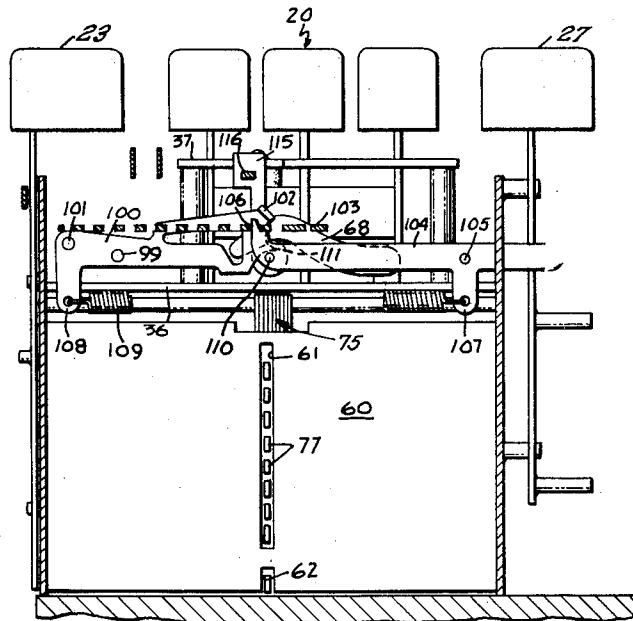


FIG. 4

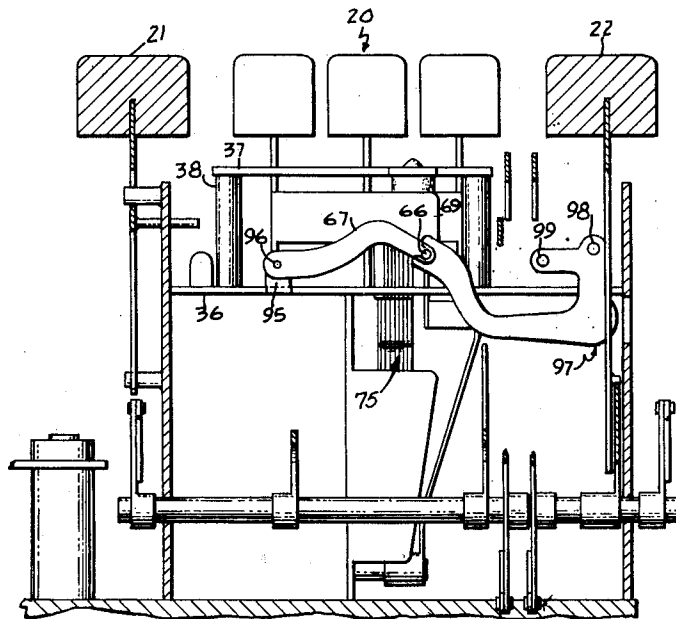


FIG. 5

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3,055,579

CALCULATING MACHINE

Harold J. Chall, Castro Valley, and Harry D. Foreman, San Leandro, Calif., assignors to Friden, Inc., a corporation of California

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4 Claims. (Cl. 235—60)

This invention relates to calculating machines, such as the ten-key adding machine shown in Patent No. 2,832,530, issued April 29, 1958, to Harold J. Chall for "Value Selecting and Transmitting Mechanism for Listing Adding Machine," and constitutes an improvement over the invention shown in the patent to Harold J. Chall, No. 2,886,237 issued May 12, 1959, and entitled, "Shock Absorbing Selection Mechanism for a Calculating Machine."

In a calculating machine, such as the adding machine shown in the above-noted patents wherein a plurality of selection sectors are ordinarily arranged on a carriage, wherein the sectors are movable by spring force about a common axis to differentially set angular positions corresponding to the entry of successively selected entry values into the selection mechanism of the machine, and wherein value-selection keys control inter alia both the release of said sectors for value entry and movement of the carriage for bringing the sectors successively into value entry position, it is possible when the value key is only partially depressed, to release the sector without causing movement of the carriage.

It is among the objects of the present invention to provide an improved selection delay mechanism for ensuring the movement of the carriage each time a selector sector is actuated by a value key.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings wherein:

FIG. 1 is a fragmentary top plan view of the forward portion of an adding machine to which the invention is applied, the machine cover having been omitted;

FIG. 2 is a longitudinal cross-sectional view through the selection mechanism of the machine, taken on the plane indicated by the line 2—2 of FIG. 1;

FIG. 3 is a perspective view of a lever that is a part of the described embodiment of this invention;

FIG. 4 is a cross-sectional view of the selection mechanism taken on the plane indicated by the line 4—4 of FIG. 1; and

FIG. 5 is a cross-sectional view of the selecting mechanism taken on the plane indicated by the line 5—5 of FIG. 1.

Referring particularly to FIG. 1, the machine has a ten-key keyboard including nine numeral keys 20, numbered from "1" to "9," arranged in a 3 x 3 square formation, and a "0" key 21 disposed at the left-hand side of the group of digit keys. Control keys are arranged around the ten-key keyboard and include the add key, or plus bar 22, the subtract or minus, key 23 and the "Print Only" or non-add, key 24 at the right-hand side of the keyboard. The "SUB TOTAL" key 25 and "TOTAL" key 26 are disposed at the front of the keyboard, while the "CLEAR KEYBOARD," or error, key 27 and the "REPEAT ADD" key 28 are disposed directly rearwardly of the "0" key 21 and at the left-hand side of the group of digit keys 20.

The complete selection mechanism is somewhat diagrammatically illustrated in FIG. 2. It will be noted in FIG. 2, that the keys 20 have flat stems 35 slidably mounted for vertical movement in a fixed keyboard frame, having a bottom plate 36 and a top plate 37 held in spaced

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and parallel relationship to each other by suitable spacing elements 38.

The selection mechanism also includes a shiftable unit, generally indicated at 39, the carriage of which comprises a pair of end plates 40, shown in FIGS. 1 and 2, secured in spaced and parallel relationship to each other by suitable tie rods and shafts supporting various parts of the selection mechanism. One of these shafts constitutes an axle 41 extending between, and mounted at its ends in, the carriage end plates 40. This axle carries a series of rockable selection sectors 42, each of which comprises two integral but substantially diametrically opposite sections. One section of each selection sector constitutes a numeral dial 43, which dial is visible through a window (not shown) provided in the machine cover when an entry is made into the selection mechanism, so that the operator can visually check the values entered. The other section of each selection sector comprises an arcuate rack 44, the purpose of which will be presently described. The selection sectors are resiliently urged toward an extreme value position, in a clockwise direction as illustrated in FIG. 2, by individual tension springs 45, and are releasably held against rotation from the bias of the springs 45 by individual zero latch pawls 46. Each selection sector 42 carries a pivotally mounted live point 47, which is held in engagement with the flat end of a forward extension 48 of the rack 44 by a spring 49. Each live point has a forwardly directed nose formation 50, which engages the rear end of a zero latch 46 to releasably hold the sector against rotational movement. The zero latches 46 are ordinarily mounted on a shaft 51, which is located in the lower portion of the carriage 39, and which extends between, and is mounted in, the end plates of the carriage, each latch being resiliently urged to the operative position in which it engages coordinial live point 47 by a tension spring 52.

A pin box, generally indicated at 55, comprises a rear wall 56, a front wall 57, and contains a plurality of settable pins 58, which are slidably mounted in registering apertures in the pin box walls 56 and 57. These pins are arranged in ordinal rows, each row being aligned with one of the selection sectors 42 of the selection mechanism. There are eight pins in each row, respectively settable by the digit keys "1" to "8," positioned to stop the related sector 42 in a differential position corresponding to the value of the key depressed. There is preferably no pin for a value of "9," the depression of that key releasing the sector for free rotation until stopped by a fixed bar 59, extending between the end frames of the plates 40, and constituting the "9" stop.

A fixed guide plate 60 is disposed forwardly of the settable pins 58 and parallel to the front wall 57 of the pin box. This plate is provided with a vertical slot 61 (FIGS. 2 and 4) located at the selection pin setting station of the pin box. A zero latch release lever 62 is pivotally mounted on the base of the machine and has its rearward end extending through a small slot aligned with the slot 61, and hence is positioned to engage under the front end of the zero latch 46 located at the selection station. This release lever is connected by a link 63 to the rearward end of a lever 64, pivotally mounted intermediate its length on a pivotal support 65. The forward end of the lever 64 is turned upwardly through a slot in the keyboard base plate 36 to form a nose, and is disposed beneath a bar 66, which extends longitudinally of the keyboard. The bar 66 is mounted in a pair of similar arms 67 and 68, the front arm 67 positioned at the forward side of the keyboard and the rearward arm 68 positioned at the rearward side of the keyboard, so that the bar 66 can be moved in a substantially vertical direction. Each of the key stems 35 of value keys "1" to "9" is provided with an extension, as indicated at 69,

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overlying the bar 66, so that this bar is moved downwardly and rocks the lever 64 whenever a digit key of the keyboard is depressed. The rocking of the lever 64, by depression of a keyboard key, lifts the link 63 and the rear end of the lever 62 to rock the zero latch lever 46 in the selection station, in a clockwise direction as viewed in FIG. 2. Such rocking of the zero latch moves it away from the nose 50 of the coordinial live point 47, and thereby frees the associated selection sector 42 for rotational movement by its corresponding springs 45.

Eight bellcrank levers 75 (one for each of value keys "1" to "8") are rockably mounted on a pivotal support 76 in side-by-side relationship. Each of these bellcrank levers 75 has an upwardly turned nose at its front end, so positioned as to be engaged by the bottom end of the stem 35 of the respective digit key 20. At its lower end, each of the levers 75 is provided with a rearwardly directed finger formation 77, movable through the slot 61 in the plate 60 to engage the front end of the corresponding settable pin 58 to move the pin rearwardly. The finger formations 77 of the levers 75 are arranged in vertical sequence and in a manner such that the lowermost finger is moved when the "1" key is depressed and the uppermost finger is moved when the "8" key is depressed. These levers are resiliently held in their retracted position by individual tension springs 78, connected between the levers and a spring-supporting bracket 79, and are moved rearwardly only when their corresponding digit keys are depressed.

The mechanism thus briefly described provides an arrangement in which the depression of one of the digit keys "1" to "8" results in first moving the corresponding settable pin 58 rearwardly to its set position. Immediately thereafter, as a result of further depression of the key, the zero latch 46 at the selection station is moved to release the coordinial selection sector 42. The spring 45 then turns the selection sector until the nose formation 50 of the associated live point 47 strikes the rear end portion of the set pin 58, thereby stopping the selection sector at an angular position corresponding to the value of the key which was depressed. When the "9" key is depressed, the zero latch 46 at the selection station is released, but there being no pin 58 corresponding to the "9" key, the spring 55 will rotate the sector until the rearwardly disposed edge of the sector spoke 80 engages the fixed stop 59 and stops the sector. The rotated position of the sector 42 corresponding to the entry of a "0" is the position in which it is held by the zero latch 46. Consequently the "0" key 21 does not release the sector 42 for rotation.

Each of the value selecting keys, including the "0" key, when depressed, acts to move the whole shiftable selection unit 39 one ordinal step to the left, as will be explained presently. However, it can be mentioned here that following the machine operation, when the carriage is returned to its home, or right-hand, position, cam fingers 81 of a fixed comb extend through closed slots in the forward portion of the pins 58 and retract those pins which have been set during the selection operation to their normal, or retracted, position.

The carriage of the shiftable selection unit 39 is slidably mounted for transverse movement on an upper rail 85 and a bottom rail 86 suitably secured in the framework of the machine. The unit 39 is resiliently urged to the left by a strong spring 87 (FIG. 1) and is restrained against such movement by an escapement mechanism actuated by the value keys 20 and 21.

Referring to FIG. 5, the front pivot arm 67 is pivoted on an upstanding ear 95 upwardly projecting from the bottom keyboard plate 36, the arm being pivoted to this ear 95 by a pin 96. The free end of the arm 67 is secured to the bar 66, previously mentioned. A bellcrank 97 is pivoted on an upwardly extending ear from the bottom key plate 36, being pivoted thereon by pin 98. One arm of this bellcrank 97 extends to the left, and at

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its distal end is bifurcated to receive the bar 66. The bellcrank 97 also has a horizontal upper arm extending to the left (FIG. 5) which supports a rearwardly directed bar 99. When the numeral keys 20 are depressed, and by virtue of the overlying ears 69 on the bar 66, the bar 66 will rock downwardly. The rocking of bar 66, through the bell crank 97, causes the bellcrank 97 to rotate, in a counter-clockwise direction as viewed in FIG. 5. The rearward end of bar 99, as viewed in FIG. 4, is secured in a rack retarding pawl 100, which is pivoted at 101 on an upstanding ear from the bottom keyboard plate 36. The pawl 100 is provided at its free end with an inclined ear 102 which is normally disposed above a rack bar 103 that is fixed by suitable means to the rear pin box plate 56 (FIG. 2), which inclined ear is movable into an interdental space of the rack bar, when the selector unit is stepped to the left, as will be presently described.

A sear arm 104 is pivotally mounted to an ear by a pin 105 (FIGS. 1 and 4) located at the rear left-hand corner of the bottom key supporting plate 36. This arm 104 extends to the right from its pivot 105 (to the left as viewed in FIG. 4) along, and below, the rack bar 103. The arm 104 is provided on its free end with a detent formation 106 which projects upwardly between two adjacent teeth of the rack bar 103 and releasably restrains the selector unit against movement to the left (to the right in FIG. 4). Sear arm 104 is provided at its pivoted end with a downwardly projecting extension 107, and the pawl 100 is provided at its pivoted end with a similar downwardly projecting extension 108. A tension spring 109, connected between the lower ends of the extensions 107 and 108, resiliently urges the free ends of the sear arm 104 and the pawl 100 upwardly, positioning the detent formation 106 into an interdental space of the rack bar 103. The sear arm 104 has, at its free end below the detent formation 106, a forwardly projecting pin 110 underlying an extension 111 on the free end of the rack retarding pawl 100. This extension 111 overlies pin 110, and when the rack retarding pawl 100 is depressed, it will carry the sear arm 104 downwardly. Thus, when the bar 66 is pressed down by the depression of a numeral key, as described above, it will rock the bellcrank 97 and the bar 99, thereby rocking the rack retarding pawl 100 downwardly and forcing the sear arm 104 downwardly. The downward movement of the sear arm 104 will remove its detent formation 106 from between the interdental spaces of the rack bar 103 and at the same time move the ear 102 of pawl 100 into an adjacent interdental space. As the ear 102 has a thickness less than the distance between the two adjacent teeth on the rack bar 103, it will permit sufficient movement of the rack bar to the left of the machine (to the right in FIG. 4) to bring a tooth of the rack bar 103 above the detent 106 of the sear arm 104. When the manually depressed number key 20 is released, freeing the spring 109 to restore the arm 104 and the pawl 100, the detent 102 will be moved out of the interdental space in which it is engaged and the detent 106 will first contact the bottom surface of the rack tooth immediately above it, and then, as the rack bar 103 shifts to the left, it will set into the next interdental space to the right and terminate the leftward movement of the shiftable carriage 39. The selector mechanism has then been shifted one ordinal space, i.e., the center-to-center distance between the two adjacent selector sectors to the left.

The mechanism described thus far herein is similar to mechanism shown and described in the patents hereinbefore referred to. The machine of the present invention also includes an upstanding link 115 positioned forwardly of the rack pawl 100 and the sear arm 104 (FIGS. 2 and 4). The lower portion of the upstanding link 115 is secured to the pin 110 on the sear arm 104, previously mentioned. The upper part of link 115 is

provided with an enclosed slot 116. A lever 117 (FIGS. 1 and 2) extending rearward from link 115 has a downwardly directed ear 120 intermediate its ends which lies adjacent to an upstanding ear 119 directed from a transverse bracket 121. A pivot pin 118 passes through an aperture in the ears 118 and 119 to pivot the arm 117 thereon.

The forward extension of the lever 117 is provided with a reduced end 122 lying in the slot 116 of the upstanding link 115. The rearwardly directed portion of lever 117 terminates in downwardly bent ear 123, provided with a formed cam tip 124 attached by suitable means, such as rivets 125 (FIG. 3). The cam tip 124 extends to the left to lie to the rear of the selection segment 42, lying in the selection station, i.e., the leftmost segment when the segments are in their home, or rightmost, position, shown in FIG. 1. The left extremity of the cam tip 124 is formed with a slightly beveled edge 126.

When a value key 20 is depressed, it positions a stop pin 58 and releases the corresponding zero latch 46, thereby releasing the corresponding selection sector 42 to move to the angular position determined by the settable stop pin 58, as was described. The depression of the value key also moves the escapement levers 100 and 104 down and turns the lever 117 counter-clockwise, as seen in FIG. 2, thereby lifting the tip 124 to let the numeral-carrying part 43 of sector 42 pass under it.

If the adjustment of the mechanism is such that a numeral key need not be depressed as far to release sector 42 as it must for moving detent tip 106 of sear arm 104 below the tooth of rack 103, and if the numeral key is depressed only far enough to release sector 42, then part 43 thereof rides under bevel 126 of the partially lifted tip 124, to cam the tip 124 up and the lever 117 counter-clockwise as seen in FIG. 2. This movement of lever 117 forces the sear arm 104 down to its completely activated position, thereby ensuring release of the selector carriage by the arm 104, and a step movement of the carriage in spite of the incomplete depression of the numeral key. The resulting leftward step of the carriage carries that one sector 42 leftward out from under, and clear of, the tip 124, and aligns the next sector 42 (the one to the right of the one just released) with the tip 124 for the manual selection of the next digit.

With the release of the value key 20, the escapement will complete one ordinal step to the left. With the return of the sear arm 104 to its home position by the spring 109, as shown in FIG. 4, the delay arm 117 will be urged by this same spring to drop behind the segment that has been stepped to the selection station.

What is claimed is:

1. In a shiftable selection mechanism including a plurality of ordinally arranged selection sector assemblies mounted for angular movement about a common axis and each including a sector component, a live point component, resilient means urging said selection sector assemblies to move in one direction about said common axis, latch means releasably latching said selection sector assemblies against movement, settable stop means disposed adjacent said selection sector assemblies to engage said live point components and thereby stop said

selection sector assemblies when released from said latch means at differentially set positions for entry of selected values into said shiftable selection mechanism, value keys disposed adjacent said stop means for releasing said latch means and selectively setting said stop means, and an escapement means operated by depression of said value keys to step said shiftable selection mechanism in sequential leftward steps, the improvement comprising cam means engageable by said selection sector assemblies during angular movement thereof for positively urging said escapement mechanism to its operated position.

2. In a shiftable selecting mechanism including a plurality of ordinally arranged selecting sector assemblies movable about a common axis, latch means for releasably latching said selecting sector assemblies against movement, means for biasing said sectors to an extreme value position, settable stop means to stop the selecting sectors at a differentially set position, value keys for releasing said latch means and setting said stop means, and escapement means operable by said value keys to shift said shiftable selection mechanism in a step-by-step sequence, the improvement comprising a rockable arm connected with said escapement means and positioned to be engaged by said selection sector assemblies for driving said escapement means.

3. In a shiftable selection mechanism including a plurality of ordinally arranged selection sector assemblies, resilient means urging said selection sector assemblies to an extreme position, latch means for releasably latching said selection sector assemblies against movement, settable stop means to stop said selection sectors at differentially set positions, value keys for releasing said latch means and setting said settable stop means, and escapement means operable by said value keys to shift said shiftable selection mechanism in a step-by-step sequence, the improvement which comprises means operated by said selection sector assemblies to positively move the said escapement mechanism to its operative position.

4. In a shiftable selection mechanism including a plurality of ordinally arranged selection sector assemblies mounted for angular movement about a common axis and each including a sector component, a live point component, resilient means urging said selection sector assemblies to move in one direction about said common axis, latch means releasably latching said selection sector assemblies against movement, settable stop means disposed adjacent said selection sector assemblies to engage said live point components and thereby stop said selection sector assemblies when released from said latch means a differentially set position for entry of selected values into said shiftable selection mechanism, value keys disposed adjacent said stop means for releasing said latch means and selectively setting said stop means, and an escapement means operated by depression of said value keys to step said shiftable selection mechanism in sequential steps, the improvement comprising a rockable lever connected to said escapement means and having cam means positioned to be engaged by said selection sector assemblies upon angular movement thereof for positively urging said escapement mechanism to its operated position.

No references cited.